US009420935B2

(12) **United States Patent**
Beshears, Jr. et al.

(10) **Patent No.: US 9,420,935 B2**
(45) **Date of Patent: *Aug. 23, 2016**

(54) **NON-INTEGRATED BULK DISPENSER AND METHOD OF OPERATING A DISHWASHER HAVING SAME**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 237 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/134,473**

(22) Filed: **Dec. 19, 2013**

(65) **Prior Publication Data**

US 2014/0110430 A1 Apr. 24, 2014

Related U.S. Application Data

(60) Continuation of application No. 13/608,034, filed on Sep. 10, 2012, now Pat. No. 8,627,984, which is a division of application No. 12/952,571, filed on Nov. 23, 2010, now Pat. No. 8,337,628.

(51) **Int. Cl.**
A47L 15/00 (2006.01)
A47L 15/44 (2006.01)

(52) **U.S. Cl.**
CPC ***A47L 15/0055*** (2013.01); ***A47L 15/0047*** (2013.01); ***A47L 15/449*** (2013.01); ***A47L 15/4463*** (2013.01); *A47L 2401/023* (2013.01); *A47L 2401/20* (2013.01); *A47L 2401/26* (2013.01); *A47L 2501/26* (2013.01)

(58) **Field of Classification Search**
CPC A47L 15/0047; A47L 15/00551; A47L 15/4463; A47L 15/449; A47L 2501/26; A47L 2401/023; A47L 2401/20; A47L 2401/26
See application file for complete search history.

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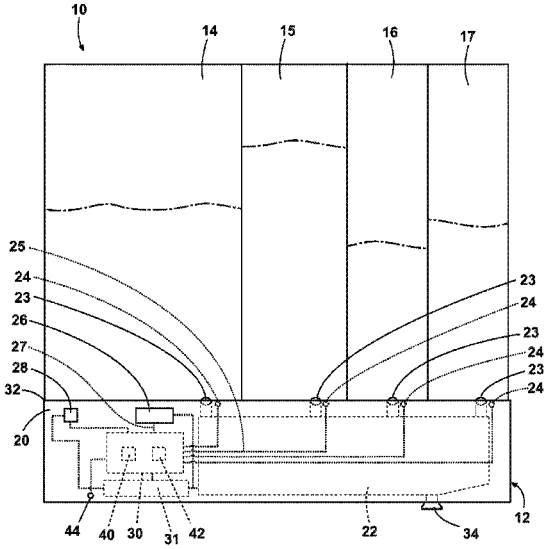
(57) **ABSTRACT**

A removable non-integrated treating chemistry dispensing cartridge assembly may emit a signal in response to a predetermined amount of treating chemistry being detected and in response to a predetermined amount of illumination being detected.

10 Claims, 5 Drawing Sheets



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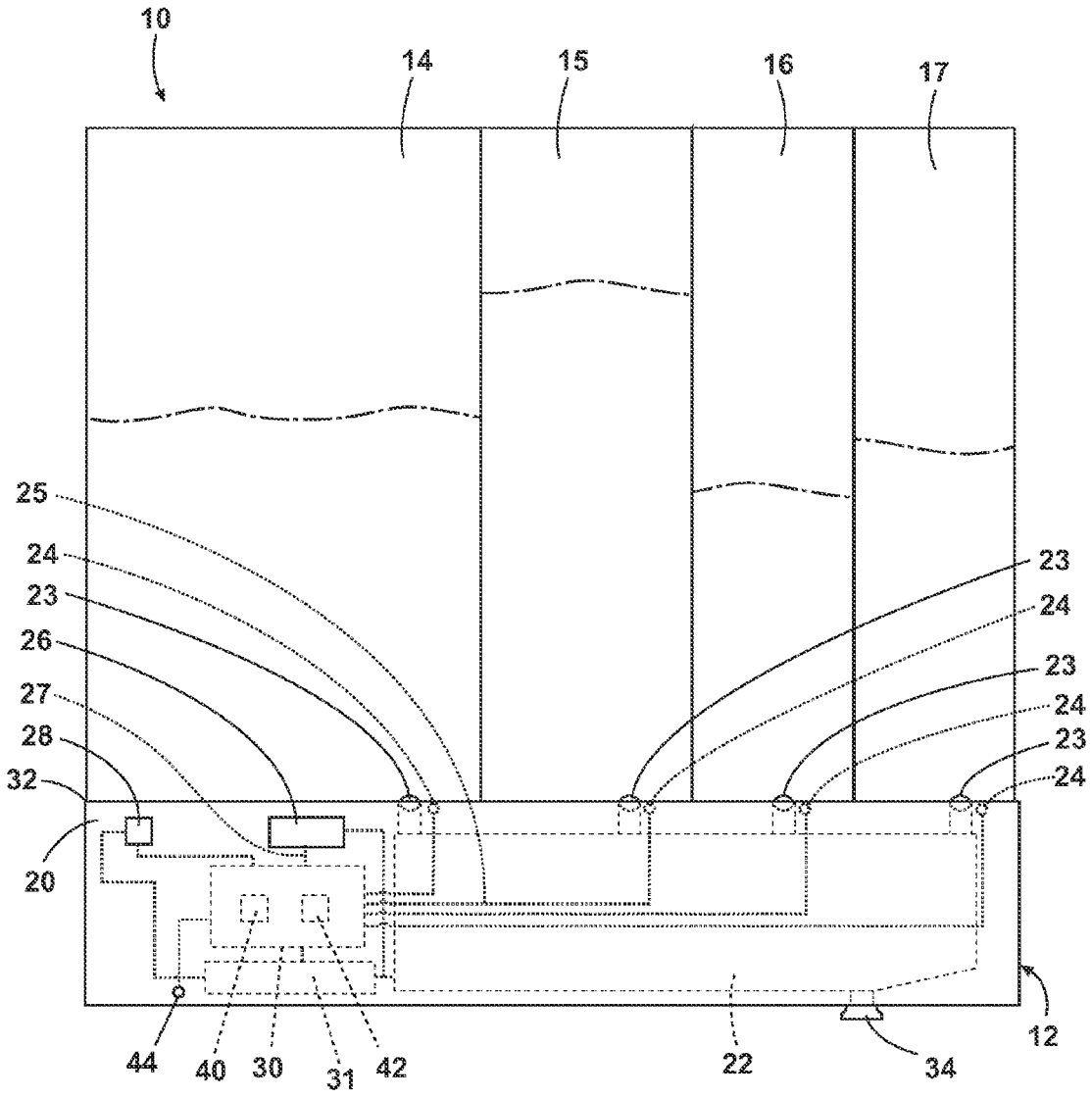
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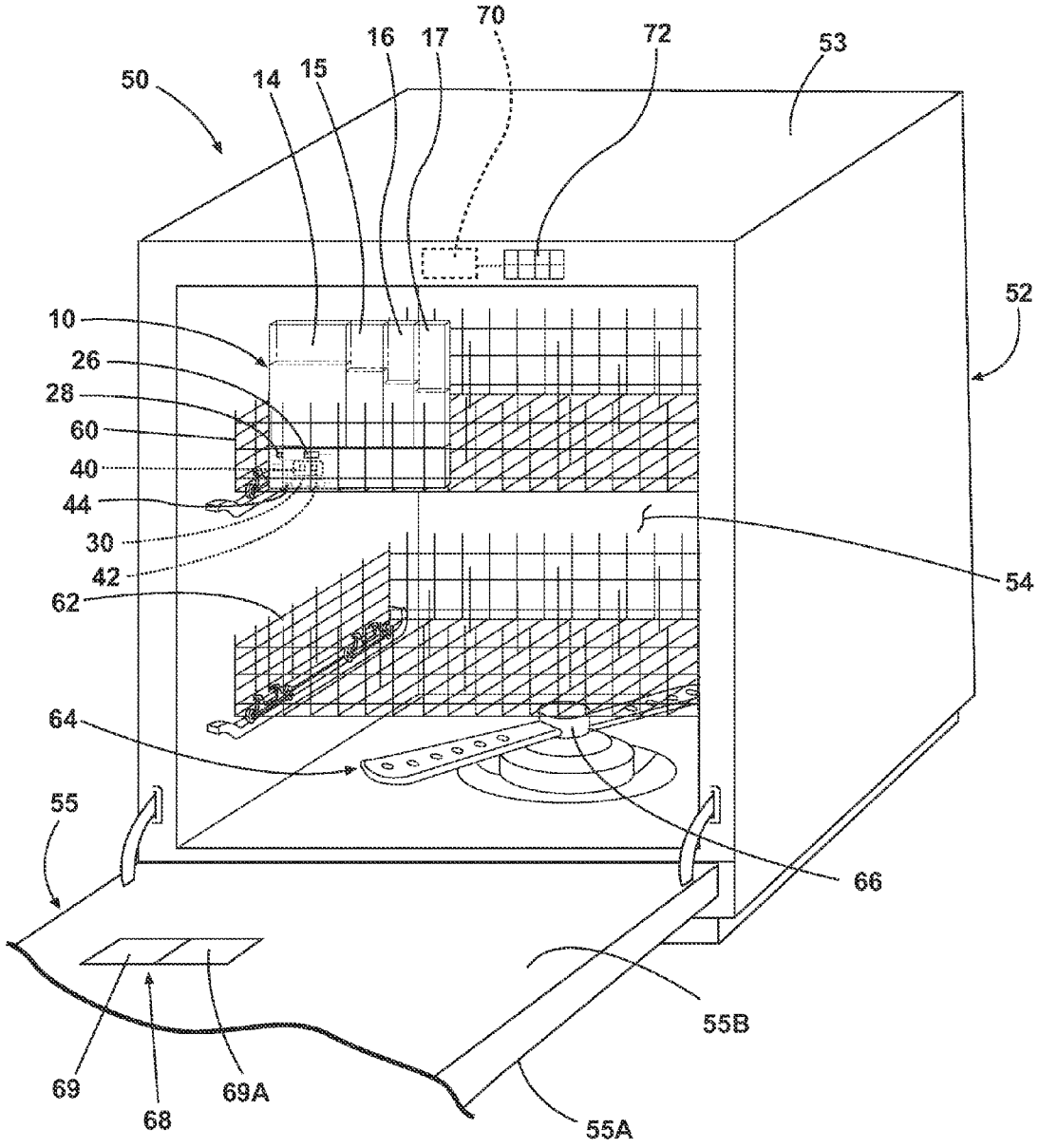
34
12

Fig. 1


70
16
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72
53
50
14
15
52
10
26
28
60
40
44
30
42
62
54
64
55
66
55B
69
68
69A
55A

Fig. 2

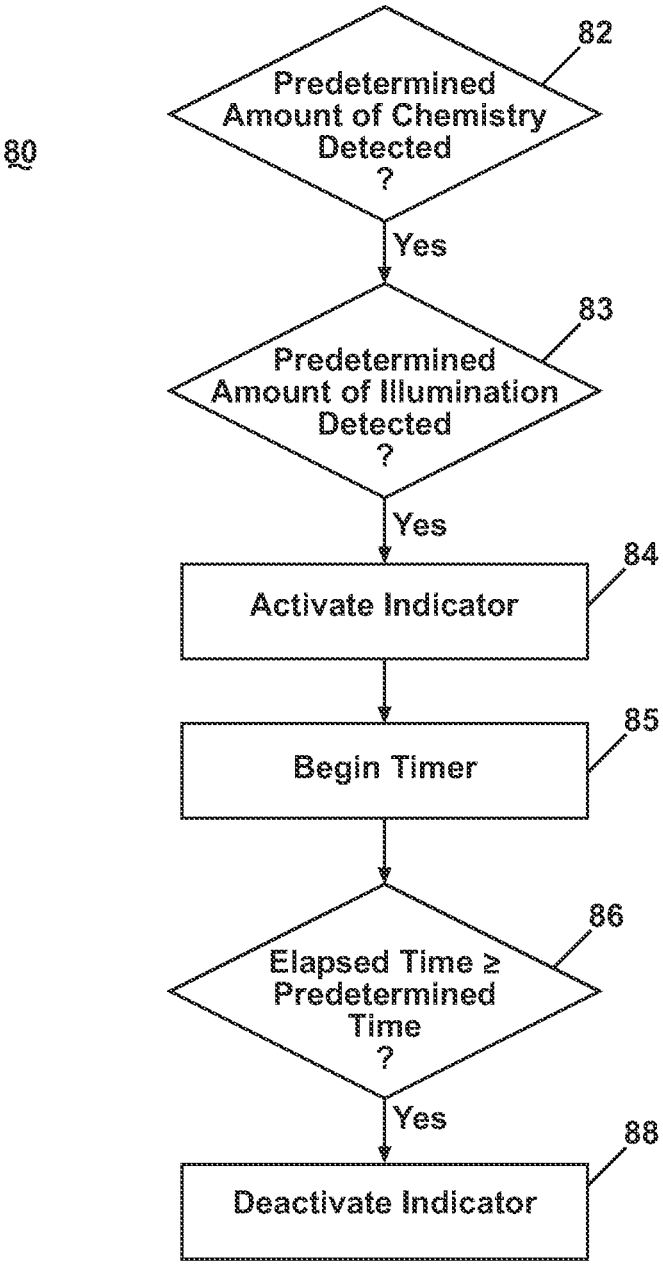
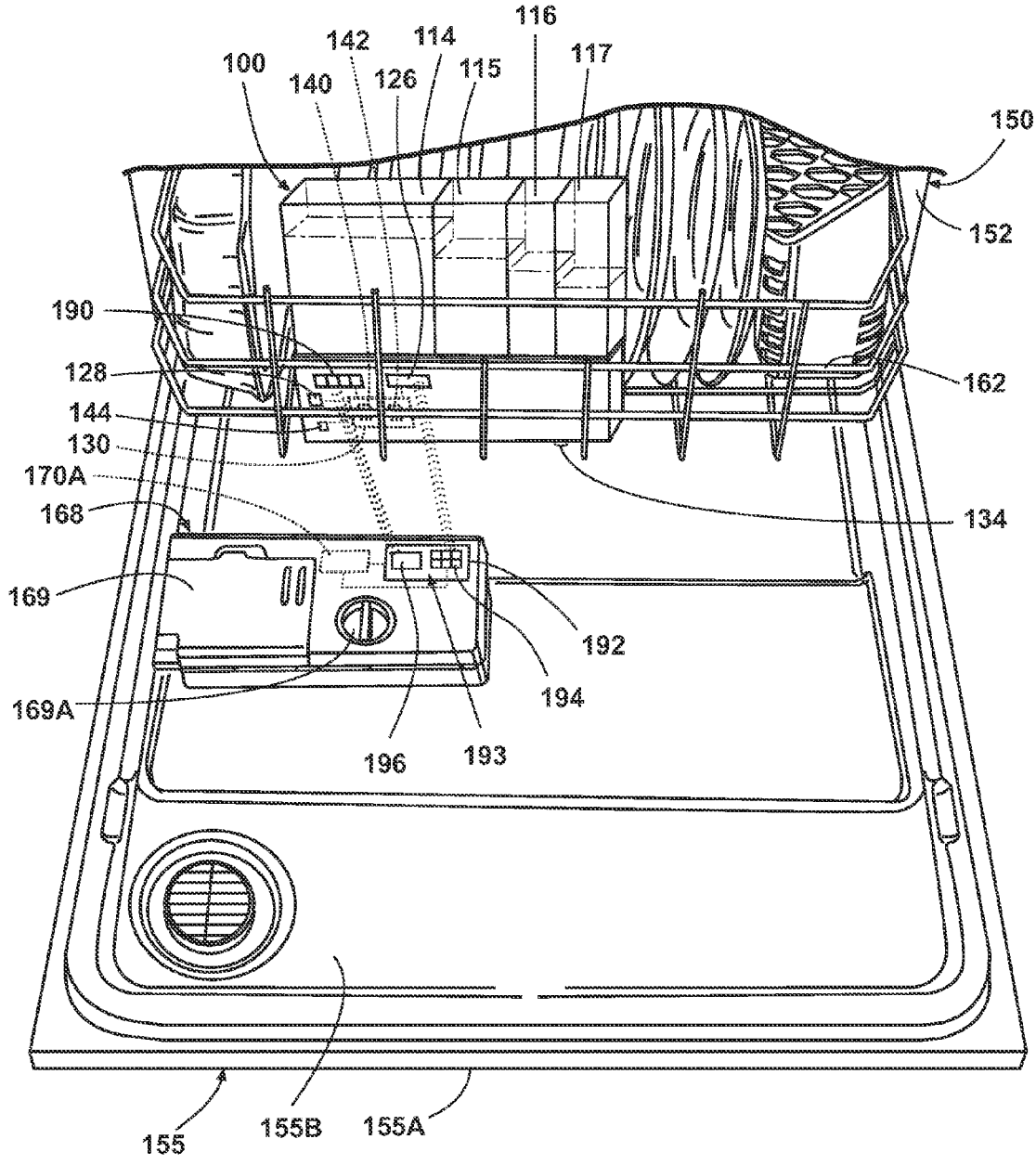

80
82
Predetermined Amount of Chemistry Detected ?
Yes
83
Predetermined Amount of Illumination Detected ?
Yes
84
Activate Indicator
85
Begin Timer
86
Elapsed Time ≥ Predetermined Time ?
Yes
88
Deactivate Indicator

Fig. 3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142
114
100
140
126
115
117
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152
190
128
162
144
130
170A
168
134
169
192
194
169A
196
193
155
155B
155A

Fig. 4

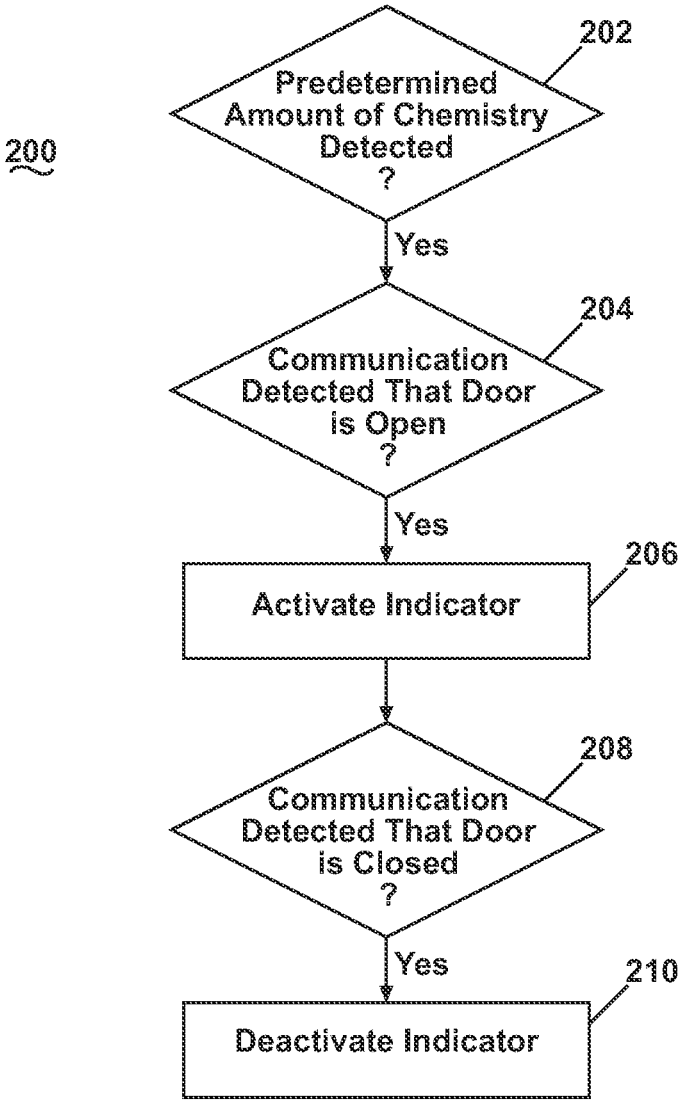
200
202
Predetermined Amount of Chemistry Detected ?
Yes
204
Communication Detected That Door is Open ?
Yes
206
Activate Indicator
208
Communication Detected That Door is Closed ?
Yes
210
Deactivate Indicator

Fig. 5

NON-INTEGRATED BULK DISPENSER AND METHOD OF OPERATING A DISHWASHER HAVING SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application represents a continuation of U.S. patent application Ser. No. 13/608,034 filed Sep. 10, 2012, which is a divisional application of U.S. Pat. No. 8,337,628 entitled "Non-Integrated Bulk Dispenser and Method of Operating a Dishwasher Having Same" filed Nov. 23, 2010.

BACKGROUND OF THE INVENTION

Contemporary appliances such as a dishwasher may have one or more dispensers for automatically dispensing one or more treating chemistries at an appropriate time during a cycle of operation. One common type of dispenser is the manual or single use dispenser, which can be filled with only enough treating chemistry for a single cycle of operation. Another common type of dispenser is a bulk dispenser, which may contain enough treating chemistry for multiple cycles.

SUMMARY OF THE INVENTION

The invention relates to a removable, non-integrated bulk dispensing assembly which may emit a signal in response to a predetermined amount of treating chemistry being detected and when a predetermined amount of illumination has been detected.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** is a front view of a removable, non-integrated dispenser in accordance with a first embodiment of the invention.

FIG. **2** is a schematic perspective view of a dishwasher comprising a dispensing system in accordance with the first embodiment of the invention.

FIG. **3** is a flow chart depicting one method of operating the non-integrated dispenser in a household dishwasher in accordance with the present invention.

FIG. **4** is a partial perspective view of a portion of a dishwasher, including a non-integrated dispenser, according to a second embodiment of the invention.

FIG. **5** is a flow chart depicting another method of operating the non-integrated dispenser in a household dishwasher in accordance with the present invention.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Referring now to FIG. **1**, a removable, non-integrated dispensing cartridge assembly **10** is illustrated. The dispensing cartridge assembly **10** has been illustrated as including a base **12**, which may be operably coupled to multiple cartridges **14**, **15**, **16**, **17**. The base **12** is formed by a housing **20** and includes a pump assembly **22**, a chemistry detector **24** capable of indicating a low level of treating chemistry, an illumination detector **26**, at least one indicator **28**, a controller **30**, and a power source **31**.

The multiple cartridges **14-17** may be replaceably mounted within an upper portion **32** of the base **12** for ease of replacement. Each of the multiple cartridges **14-17** forms a treating chemistry reservoir configured to store multiple doses of a treating chemistry stored therein and sufficient for several cycles of operation.

As used herein, the term "multiple doses of treating chemistry", and variations thereof, refers to an amount of treating chemistry sufficient for multiple cycles of operation of an appliance. As used herein, the term "single dose of treating chemistry", and variations thereof, refers of an amount or volume of treating chemistry sufficient for one cycle of operation. The amount or volume of the treating chemistry may vary depending on the selected cycle of operation, but only enough for one cycle is used. As used herein, the term "cycle of operation" refers to one operational cycle of an appliance. When one of the multiple cartridges **14-17** is received within the base **12**, the dispensing cartridge assembly **10** functions as a bulk dispensing system.

Although the multiple cartridges **14-17** have been illustrated as box-like containers, the multiple cartridges **14-17** may be any type of removable container configured to store multiple doses of a treating chemistry. The container may have any shape and size so long as it is receivable within the base **12**. The removable container may be flexible, rigid, expandable, or collapsible. The container may be made of any type of material. Some examples of suitable cartridges are, without limitation, a plastic container, a cardboard container, a coated cardboard container, and a bladder, all of which are capable of being received within the base **12**. Further, the multiple cartridges **14-17** may be of a type where they are replaced when empty or the multiple cartridges **14-17** may be of a type where they may have an opening through which the treating chemistry may be refilled after one or multiple uses.

A pump assembly **22**, housed within the base **12**, may have multiple inlets **23** coupled to an outlet **34**, with the inlets **23** operably coupled to the multiple cartridges **14-17** to establish a metered bulk flow path from the multiple cartridges **14-17** to the outlet **34** and to the environment surrounding the dispensing cartridge assembly **10**. Each of the inlets **23** may correspond to one of the multiple cartridges **14-17**. The pump assembly **22** may allow for a fractional amount of the entire volume of each of the multiple cartridges **14-17** to be dispensed and it may also allow for a specific volume to be dispensed. More specifically, treating chemistry may be drawn out of one of the multiple cartridges **14-17** by the pump assembly **22** through the pump inlet **23** and may then be pumped out the outlet **34** to the environment surrounding the dispensing cartridge assembly **10**.

Although only one outlet **34** has been illustrated in FIG. **1** it is contemplated that multiple outlets **34** may exist. Different types of treating chemistries may be housed in the multiple cartridges **14-17**, e.g. a detergent, a drying agent, a spot reducer, a rinse agent, a stain remover, bleach, etc. Some of these treating chemistries may be deleterious to another chemistry's efficacy. Thus, fluidly separate flow paths, including separate pump assemblies and outlets may be provided such that the different types of treating chemistries are not intermingled.

Alternatively, it has been contemplated that the multiple cartridges **14-17** may dispense through the one or more outlets **34** in the base **12** without the aid of the pump assembly **22**. In such an instance, the multiple cartridges **14-17** may include an integrated metering device that electronically couples, wired or wirelessly, to the controller **30** to control the amount of treating chemistry dispensed.

The treating chemistry detector **24** may include one or more sensors for sensing the amount of treating chemistry in each of the multiple cartridges **14-17**. Multiple chemistry detectors **24** have been illustrated, with at least one detectors

24 provided for each of the multiple cartridges 14-17. A detector lead 25 couples each of the detectors 24 to the controller 30. With this configuration, each treating chemistry detector 24 may output a first signal indicative of the amount of treating chemistry in each of the corresponding multiple cartridges 14-17. It has also been contemplated that one treating chemistry detector 24 may be used to sense the amount of treating chemistry in all of the multiple cartridges 14-17.

Each treating chemistry detector 24 may be a resistivity sensor having a pair of spaced electrodes in contact with the treating chemistry and capable of generating a signal proportional to the level of the treating chemistry in each of the multiple cartridges 14-17. Each treating chemistry detector 24 may also be an optical sensor, such as a refractive index sensor containing a transmitter and a sensor whereby a beam of light may be projected onto the treating chemistry surface from the transmitter back to the sensor, which generates a signal consistent with either the chemistry or air to determine if the treating chemistry is present in each of the multiple cartridges 14-17. Each treating chemistry detector 24 may also be a height transducer capable of generating a signal proportional to the height (and thus the volume) of the treating chemistry in each of the multiple cartridges 14-17. Alternatively, each treating chemistry detector 24 may be a level sensor such as a float or reed switch that may switch on or off when the fluid reaches a certain level in each of the multiple cartridges 14-17.

Alternatively, the treating chemistry detector 24 may merely recognize that each of the multiple cartridges 14-17 is received within the base 12. In this manner the sensor 24 may be an indirect means for determining the amount of treating chemistry in each of the multiple cartridges 14-17. The amount of treating chemistry in each of the multiple cartridges 14-17 may be inferred based on detected conditions of the dispensing cartridge assembly 10 that indicate when each of the multiple cartridges 14-17 is received within the base 12 and operations of the dispensing cartridge assembly 10. For example, the sensor 24 may be used to determine when the cartridge 14 is received within the base 12. If the cartridge 14 is detected as having been inserted into the base 12, the controller 30 may infer that the user has inserted a full cartridge having a predetermined number of doses into the dispensing cartridge assembly 10. Every time the dispensing cartridge assembly 10 dispenses from the cartridge 14 the controller 30 may infer that a predetermined number of doses are left in the cartridge 14. In this manner an amount of treating chemistry or remaining number of doses, in the removable dispensing cartridge 14 may be determined by the controller 30.

Regardless of the type of treating chemistry detector 24 the signals output from the treating chemistry detectors 24 may be delivered to the controller 30 through the detector leads 25. The foregoing descriptions are merely exemplary treating chemistry detector locations and it may be understood that other locations may be utilized for a treating chemistry detector 24. For example, a treating chemistry detector 24 may be incorporated into the pump assembly 22.

The illumination detector 26 may include one or more sensors for sensing the amount of illumination around the dispensing cartridge assembly 10. An illumination detector lead 27 may electrically couple the illumination detector 26 with the controller 30. The illumination detector 26 may output a second signal indicative of the ambient illumination. Non-limiting examples of illumination detectors 26 include a CCD detector, a CMOS camera, a photo-detector, a photodiode, a silicon detector and combinations thereof for sensing ambient light. Regardless of the type of illumination detector 26 a signal output from the illumination detector 26 may be delivered to the controller 30 through the illumination detector lead 27.

The indicator 28 may be any type of indicator capable of outputting a human-detectable signal. It may be easily understood that a human-detectable signal is any signal capable of being detected by a user. Such indicators may include a visible or light-type indicator or an audible-type indicator or any combination of visible or audible human-detectable signals. Examples of light type indicators may include an incandescent lamp, a light emitting diode (LED), or an array of several LEDs. It should be noted that the light type indicator may produce a single light pulse or a series of light pulses. Examples of audible indicators may include a piezoelectric sound generator, speaker sound generator, or electro-magnetic sound generator, or any similar sound generator capable of producing a beep, a series of beeps, an audible sound, or voice messages. The indicator 28 may indicate a general status of the dispensing cartridge assembly 10 as well as a problem condition such as a low amount of treating chemistry in one of the multiple cartridges 14-17.

The controller 30 may be provided with a memory 40 and a central processing unit (CPU) 42. The memory 40 may be used for storing control software, which may be executed by the CPU 42. The memory 40 may be used to store information, such as a database or table. The memory 40 may also be used to store data received from one or more components of the dispensing cartridge assembly 10, such as the chemistry detector 24 and the illumination detector 26, which may be communicably coupled with the controller 30. The controller 30 may also be operably coupled with indicator 28 for communicating information to the user. The controller 30 may also receive input from one or more sensors 44. Non-limiting examples of sensors that may be communicably coupled with the controller 30 include a temperature sensor, turbidity sensor, or humidity sensor. Such a sensor 44 may be coupled to the controller 30, which receives the output from the sensor 44.

The anticipated use environment of the dispensing cartridge assembly 10 generally cannot accommodate the dispensing cartridge assembly 10 being wired to a power source. Accordingly, the power source 31 may be a wireless power source allowing the dispensing cartridge assembly 10 to be self-contained and in some exemplary approaches, self-sufficient. The power source 31 may be any type of power storage device non-limiting examples of which include a battery, a flywheel, or a capacitor. The power source 31 may be located in the base 12 behind a water-tight cover (not shown) such that it may be readily accessible by a user.

When the multiple cartridges 14-17 are received within the base 12, the pump assembly 22 may selectively fluidly couple the multiple cartridges 14-17 to an outlet 34 formed in the housing 20. The pump assembly 22 may control the dosing of the treating chemistry from the multiple cartridges 14-17 through the outlet 34 to the surroundings of the base 12. The pump assembly 22 may be operably coupled with the controller 30 such that the controller 30 may control the operation of the pump assembly 22 to thereby control the dosing of the treating chemistry from the multiple cartridges 14-17 through the outlet 34 to the surroundings of the base 12. In this manner, the dispensing cartridge assembly 10 may function as a bulk dispensing system, which may dispense treating chemistry to the environment surrounding the dispensing cartridge assembly 10.

When the multiple cartridges 14-17 are received within the base 12, the chemistry detector 24 may detect an amount of treating chemistry in the multiple cartridges 14-17 and the

illumination detector **26** may detects an amount of illumination surrounding the base **12**. The controller **30** may be operably coupled with the chemistry detector **24** and the illumination detector **26** such that they may communicate with the controller **30**. The indicator **28** may also be operably coupled with the controller **30** such that the controller **30** may cause the indicator to emit a human-detectable signal based upon information received from the chemistry detector **24** and the illumination detector **26**. The power source **31** may provide electrical power to pump assembly **22**, chemistry detector **24**, illumination detector **26**, indicator **28**, and controller **30** through electrical transmission wires connected thereto.

FIG. **2** illustrates one anticipated environment for the dispensing cartridge assembly **10** in the form of an automated dishwasher **50**. The dishwasher **50** shares many features of a conventional automated dishwasher, which will not be described in detail herein except as necessary for a complete understanding of the invention.

The dishwasher **50** includes a chassis **52** which contains a wash tub **53** that defines an open-faced treating chamber **54**. A cover or door **55** may be moveably mounted to the chassis **52** between an open position, as shown in FIG. **2**, wherein the user can access the treating chamber **54**, and a closed position, wherein the door **55** covers or closes the open face of the treating chamber **54** in a conventional fashion. The door **55** comprises an outer panel **55**A and an inner panel **55**B which faces the treating chamber **54** when the door **55** is in the closed position.

While a conventional dishwashing unit having a door **55** for a cover is illustrated in FIG. **2**, the non-integrated dispenser **10** could also be placed in other types of dishwashing units such as in-sink dishwashers or drawer dishwashers including drawer dishwashers having multiple compartments. In the case of such drawer dishwashers wherein the drawer forms a treating chamber and is moveable in and out of a chassis or cabinet the chassis or cabinet overlying the drawer when the drawer is closed acts as a cover for selectively covering or closing the open face of the drawer. The non-integrated dispenser may also be placed in other appliances that require the dispensing of treating chemistries, such as clothes washers.

Utensil holders in the form of upper and lower utensil racks **60**, **62** are located within the treating chamber **54** and receive utensils for washing. The upper and lower racks **60**, **62** may be mounted for slidable movement in and out of the treating chamber **54** for ease of loading and unloading. As used in this description, the term "utensil(s)" is intended to be generic to any item, single or plural, that may be treated in the dishwasher **10**, including, without limitation; dishes, plates, pots, bowls, pans, glassware, and silverware.

The dishwasher **50** further includes a liquid system **64** for supplying, recirculating, and spraying liquid throughout the treating chamber **54**. The liquid spraying system **64** is well known and may include components such as a rotatable spray arm **66** positioned beneath the lower utensil rack **62**. The dishwasher **50** may further comprise other conventional components such as additional spray arms or nozzles, a sump, a recirculation or drain pump, a heating unit, a filter etc.; however, these components are not germane to the present invention and will not be described further herein.

An integrated dispensing system **68** may be carried by the door **55** and may include a single use dispenser **69** configured to store a single dose of treating chemistry. The single use dispenser **69** may comprise a dispenser found in many contemporary automatic dishwashers, which delivers or dispenses treating chemistry to the treating chamber **54** during a cleaning cycle of the dishwasher **50**. The dispensing system **68** may also include a rinse aid dispenser **69**A for dispensing rinse aid to the treating chamber **54** at an appropriate time during the cleaning cycle and can be configured to receive a single dose of rinse aid.

A controller **70** may also be included in the dishwasher **50**, which is operably coupled to various components of the dishwasher **50** to implement a cycle of operation. The dishwasher **50** can be preprogrammed with a number of different cycles of operation from which a user may select one cycle of operation to clean a load of utensils. Examples of cycle of operations include normal, light/china, heavy/pots and pans, and rinse only. A control panel or user interface **72** coupled to the controller **70** may be used to select a cycle of operation can be provided on the dishwasher **50**. The user interface **72** may include operational controls such as dials, lights, switches, and displays enabling a user to input commands to the controller **70** and receive information.

The controller **70** may also receive input from one or more sensors, which are known in the art and not shown for simplicity. Non-limiting examples of sensors that may be communicably coupled with the controller **70** include a temperature sensor, turbidity sensor to determine the soil load associated with a selected grouping of utensils, such as the utensils associated with a particular area of the treating chamber and a sensor for determining a load value at selected locations within the dishwasher **50**. The load value may be reflective of either or both a utensil load, i.e. the number and/or size of the utensils in the dishwasher, and/or a soil load, i.e. the quantity of soil on the utensils.

The dispensing cartridge assembly **10** may be placed anywhere within the treating chamber **54** and may act as a removable bulk dispensing assembly for the dishwasher **50**. Most practically, the dispensing cartridge assembly **10** will be placed where the user may easily access it. FIG. **2** illustrates that the dispensing cartridge assembly **10** may be placed within the upper utensil rack **60**. It has been contemplated that the dispensing cartridge assembly **10** may be positioned elsewhere in the dishwasher **50**, such as on the surface of the inner panel **55**B, within the lower utensil rack **62**, or that it may be mounted to a portion of the tub **53**.

When the dispensing cartridge assembly **10** is removably received within the treating chamber **54** the multiple cartridges **14-17** may be filled with different types of treating chemistries. Each of the multiple cartridges **14-17** may be designated as a reservoir for holding a certain type of treating chemistry. For example, cartridges **14** and **15** may each be associated with a detergent, cartridge **16** may be associated with a spot reducer or rinse agent, and cartridge **17** may be associated with a rinse agent. The dispensing cartridge assembly **10** and the integrated dispensing system **68** may both be operated such that they dispense treating chemistry during the cycle of operation being run by the dishwasher. The remainder of this embodiment however pertains only to the dispensing of treating chemistry by the dispensing cartridge assembly **10**.

During operation of the dishwasher **50**, the dispensing cartridge assembly **10** may determine when bulk dispensing may be desired and then dispense appropriate treating chemistry when that time comes. More specifically, when the dispensing cartridge assembly **10** is located within the treating chamber **54** the temperature and/or humidity inside the treating chamber **54** may be detected by the sensor **44**. The controller **30** may then utilize the temperature and humidity readings obtained from the output of the sensor **44** to determine when treating chemistry from the multiple cartridges **14-17** should be dispensed and control the operation of the dispensing cartridge assembly **10** accordingly. That is, based

on the temperature and humidity readings output by the sensor **44** to the controller **30** the dispensing cartridge assembly **10** may determine at what point the cycle of operation is at and when treating chemistry should be dispensed.

When it is determined that treating chemistry should be dispensed by the dispensing cartridge assembly **10**, the controller **30** may act to control the components of the dispensing cartridge assembly **10** to dispense the appropriate treating chemistry. For example, the pump assembly **22** may be activated to dose treating chemistry into the treating chamber **54**. The pump assembly **22** may output a single dose of treating chemistry during the single cycle of operation. Dosing of the treating chemistry does not need to be done all at one time. For example, smaller amounts of treating chemistry, in total equal to a full single dose, may be dispensed by the pump assembly **22** at separate times throughout the cycle of operation.

During operation of the dispensing cartridge assembly **10**, the controller **30** may also receive input from components of the dispensing cartridge assembly **10** and act to control other individual components of the dispensing cartridge assembly **10** accordingly. This may take place regardless of the operation of the dishwasher **50**. For example, when the dispensing cartridge assembly **10** is powered by the power unit **31** the controller **30** may receive a first signal from the chemistry detector **24** indicative of the amount of treating chemistry in the treating chemistry reservoirs. If the controller **30** determines that a low lever of treating chemistry exists the controller **30** may activate the indicator **28** to emit the human-detectable signal to alert a user that one of the multiple cartridges **14-17** needs to be refilled or replaced.

It may be understood that the power source **31** does not have endless supplies of power and that although the power source **31** may be replaced when it no longer provides power to the dispensing cartridge assembly **10** that repeated replacement of the power source **31** may become tedious for a user. Thus, the usage of power should be minimized and the dispensing cartridge assembly **10** made as efficient as possible. As a user may not always be present in the vicinity of the dispensing cartridge assembly **10**, a human-detectable signal emitted from the indicator **28** may not always be detected by a user and this may result in an inefficiency of the dispensing cartridge assembly **10**. Thus, to ensure that the human-detectable signal is emitted when a user will likely be present to detect it, the controller **30** may be capable of activating the indicator **28** only when it has been determined that a predetermined amount of illumination indicative of the door **55** being at least partially opened is present.

Referring to FIG. **3**, a flow chart of one method **80** of operating the dispensing cartridge assembly **10** to emit such a human-detectable signal is shown. The sequence of steps depicted is for illustrative purposes only, and is not meant to limit the method **80** in any way as it is understood that the steps can proceed in a different logical order or additional or intervening steps may be included without detracting from the invention. The operating method **80** begins at **82**, in which it is determined if a predetermined amount of treating chemistry is located in one of the multiple cartridges **14-17**. For ease of explanation the remainder of the method **80** will be described with respect to the cartridge **14** although the method **80** may be used with any of the multiple cartridges **14-17**.

At **82**, the determination of the amount of treating chemistry in the cartridge **14** may be made using the chemistry sensor **24** to sense the amount of treating chemistry in the cartridge **14**. After determining the amount of treating chemistry at **82**, the controller **30** may determine if the determined amount of treating chemistry in the cartridge **14** is a predetermined amount. As the method is concerned with alerting a user to a low amount of treating chemistry, the predetermined amount may be an amount that is less than or equal to a low level of treating chemistry in the cartridge **14**. Such a low level may be approximately 10-15% of the total capacity for treating chemistry in the cartridge **14**. In the case where the controller **30** determines the number of doses in the cartridge **14**, the low level of treating chemistry in the cartridge **14** may be equal to a predetermined number of doses of treating chemistry remaining in the cartridge **14**. Alternatively, the low level of treating chemistry may indicate an empty reservoir. If in **82** it is determined that such a predetermined low amount of treating chemistry is present, then the method proceeds to **83**. If in **82** it is determined that such a predetermined low amount of treating chemistry is not present, then the method repeats **82** until such a predetermined low amount of chemistry is detected.

In **83** the controller **30** may determined if a predetermined amount of ambient illumination is present around the dispensing cartridge assembly **10**. The controller **30** may receive a signal from the illumination detector **26** indicative of the amount of ambient illumination and may determine if such detected ambient illumination is a predetermined amount. As the method is concerned with alerting a user to a low amount of treating chemistry only when the door **55** is at least partially open, the predetermined amount of illumination may correlate to a level greater than or equal to an amount of ambient illumination expected when the door **55** is at least partially opened. For example, the predetermined amount of illumination may be greater than 30 lux or may be some predetermined amount depending on the anticipated lighting conditions. If in **83** it is determined by the controller **30** that such a predetermined amount of illumination, indicative of the door being at least partially opened, is present, then the method proceeds to **84**. If in **83** it is determined that such a predetermined amount of illumination, indicative of the door being at least partially opened, is not present, then the method repeats **83** until such a predetermined amount of illumination is detected.

At **84**, the indicator **28** may be activated such that it outputs a human-detectable signal such as a visible signal or an audible signal or a combination thereof. At **85**, a timer may be started so that the controller **30** may receive a signal indicative of the elapsed time from the time the indicator **28** was activated. At **86**, the controller **30** may be determined if the elapsed time is equal to or greater than a predetermined time. As the method is concerned with alerting a user when the user is around as well as conserving power, the predetermined amount of time may correlate to a time wherein it may be reasonably assumed that a user may notice the alert and determine what the alert is indicating as well as a time that would not allow too much power to be drained from the power source **31**. An example of such a predetermined time may be 5 minutes.

If in **86**, the controller **30** determines that the elapsed time is determined to be equal to or greater than the predetermined time, then the method proceeds to **88** where the indicator is deactivated and the method is finished. If the elapsed time is determined to be less than the predetermined time then the indicator remains activated and the method repeats **86** until it is determined that the elapsed time is greater than or equal to the predetermined time. It has been contemplated that the user may also turn off the indicator **28** at any time prior to it being determined that the elapsed time is greater than or equal to the predetermined time, effectively ending the method.

FIG. **4** is a partial perspective view of a portion of a dishwasher **150** in which a non-integrated dispenser **100** according to a second embodiment of the invention is contained. The dishwasher **150** with the non-integrated dispenser **100** contained therein is similar to the dishwasher **55** with the non-integrated dispenser **10** contained therein previously described and therefore, like parts will be identified with like numerals increased by **100**, with it being understood that the description of the like parts of the non-integrated dispenser **10** and dishwasher **55** applies to the non-integrated dispenser **100** and dishwasher **150**, unless otherwise noted.

One difference between the non-integrated dispenser **10** and dishwasher **55** described above and the non-integrated dispenser **100** and dishwasher **150** described in this second embodiment is that the non-integrated dispenser **100** and dishwasher **150** have the ability to communicate with each other through light communications. By way of example, if the indicator **128** of the non-integrated dispenser **100** is not an LED then the non-integrated dispenser **100** may include an additional non-integrated dispenser LED, which may include an infrared LED, or array of several non-integrated dispenser LEDs indicated as **190** in FIG. **4**. Such non-integrated dispenser LEDs **190** may be operably coupled with the controller **130** such that the controller **130** may selectively activate each of the non-integrated dispenser LEDs **190**.

Another difference is that the integrated dispensing system **168** has been illustrated as including a window **192** behind which a communication module **193** may be mounted. The communication module **193** may include a PCB (not shown), at least one LED **194**, and a receiver **196**, as well as any other necessary electronics may be installed. The communication module may be operably coupled to a secondary controller **170***a*, which may be operably coupled to the controller **170**. The controller **170***a* may selectively activate each of the LEDs **194**. Alternatively, instead of having a secondary controller **170** the communication module **193** may be operably coupled directly to the controller **170**.

Although an array having several LEDs **194** has been contemplated it may be understood that a single LED may be used. The array of several LEDs **194** is positioned such that the LEDs may shine through the window **192**. The receiver **196** may include one or more sensors for sensing illumination provided by the non-integrated dispenser LEDs **190**. Non-limiting examples of types of receivers **196** include a CCD detector, a CMOS camera, a photo-detector, a photodiode, a silicon detector and combinations thereof for sensing ambient light. Regardless of the type of receiver **196** the signal output from the receiver **196** may be delivered to the controller **170***a*.

The non-integrated dispenser **100** has been illustrated as being positioned in the lower rack **162** at a position where the non-integrated dispenser LEDs **190** face the window **192**. Although the non-integrated dispenser **100** may be placed in other areas inside the dishwasher **150**, when the non-integrated dispenser LEDs **190** face the window **192** the non-integrated dispenser **100** and the dishwasher **150** may communicate with each other by sending and receiving LED light signals. The non-integrated dispenser **100** is already equipped with an illumination detector **126** which may be capable of receiving the signals sent from the communication module **193**.

During operation the non-integrated dispenser **100** may dispense autonomously as described above or it may receive one or more communications in the form of light flashes, to command its dispensing of treating chemistry, from the communication module **193**. More specifically, during operation of the dishwasher **150** the controller **170***a* may output a signal to the array of several LEDs **194** telling it what signals to flash. These visible LED signals may then be received by the illumination detector **126**, which may then send them to the controller **130**. The memory **140** and CPU **142** of the controller may then determine what signals were sent and how to operate the non-integrated dispenser **100** accordingly.

More specifically, the communication module **193** may flash signals to the non-integrated dispenser **100** telling it to dispense a particular treating chemistry. The non-integrated dispenser **100** may receive those signals, dispense the treating chemistry, and then signal back to the communication module that the treating chemistry has been dispensed. It has been contemplated that the specific timing between the signals may determine the command. Alternatively, the array of several LEDs may have varying colors, the specific colors flashed or the arrangement of flashes may determine the command.

It has been contemplated that the dishwasher **150** and non-integrated dispenser **100** may communicate with each other for a variety of reasons. For example, the non-integrated dispenser **100** may communicate to the dishwasher **150** that it has a cartridge with a low treating chemistry level and the dishwasher **150** may then alert the user. Alternatively, the non-integrated dispenser **100** may communicate with the dishwasher **150** such that the dispensing of treating chemistry from the non-integrated dispenser **100** and the dishwasher **150** may be coordinated.

Further, it has also been contemplated that the dishwasher **150** may communicate to the non-integrated dispenser **100** that the door **155** is at least partially open such that the user may then be alerted by the non-integrated dispenser **100** when a low level of treating chemistry has been determined. Referring now to FIG. **5**, a flow chart of one method **200** of operating the dispensing cartridge assembly **100** to emit such a human-detectable signal is shown. The operating method **200** is the same as the method **80**, except that the communication module **193** may communicate with the controller **130**. More specifically, it is illustrated at **204** that the controller **130** may determine if a communication has been received from the communication module **193** that the door **155** of the dishwasher **150** is at least partially open. In such a determination, the controller **130** will determine if it has received a signal from the illumination detector **126** indicative of a signal sent from the communication module **193** that the door **155** is at least partially open. If in **204** it is determined that the communication module **193** has not communicated that the door is at least partially open, then the method repeats **204** until such a communication is detected. If in **204** it is determined by the controller **130** that the communication module **193** has communicated that the door is at least partially open then the method moves onto **206** wherein the indicator **128** may be activated such that it outputs a human-detectable signal such as a visible signal or an audible signal or a combination thereof

After the indicator **128** has been activated in **206**, the method may continue to **208** wherein the controller **130** may determined if a communication has been received from the communication module **193** that the door **155** of the dishwasher **150** has been closed. In such a determination, the controller **130** will determine if it has received a signal from the illumination detector **126** indicative of a signal sent from the communication module **193** that the door **155** is closed.

If in **208** it is determined that the communication module **193** has not communicated that the door **155** is closed, then the indicator remains activated and the method repeats **208** until such a communication is detected. If in **208** it is determined by the controller **130** that the communication module **193** has communicated that the door **155** has been closed then

the method moves onto **210** where the indicator is deactivated and the method is finished. It has been contemplated that after the indicator **128** has been activated a timer may be started as described above or that the user may also turn off the indicator **128** at any time.

It has been contemplated that the non-integrated dispenser **100** may alternatively be operated according to the method of operation **80** described above with reference to FIG. **3**. The one caveat which must be discussed is that in **83** where the controller **130** may determined if a predetermined amount of ambient illumination is present around the dispensing cartridge assembly **100** the light given off by the communication module **193** would need to be taken into consideration. In such an instance, the predetermined amount of illumination indicative of the door **155** being at least partially open would have a higher range. Likely the controller **130** would look for a level of illumination that is approximately five to ten times greater than the light emitted by the communication module **193** to indicate that the door **155** is at least partially open.

The devices and methods described above offer many benefits including the ability to have a fully automated bulk dispenser that brings to a user's attention when it is low on treating chemistry instead of the user having to check for the treating chemistry level status. Further, the devices do so in an efficient and power saving way such that the user does not constantly have to replace the power supply. The devices and methods described above also allow consumers the flexibility of providing fully automated bulk dispensing with the option of manual filling. The non-integrated dispensers described above eliminate the need for the user to remove a supply of treating chemistry from a storage space, fill a dispenser, and replace the supply of treating chemistry each time the dishwasher is operated; however, the user is given the option of doing so when they desire.

While the methods disclosed above are described with respect to a household dishwasher having only one non-integrated dispenser and one integrated dispensing system, it is understood that the method can be applied to a household dishwasher have a greater number of either type of dispensers with reasonable modifications. It is further understood that the household dishwashers may be operated in accordance with methods other than those described herein.

While the invention has been specifically described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not of limitation. Reasonable variation and modification are possible within the scope of the forgoing disclosure and drawings without departing from the spirit of the invention which is defined in the appended claims.

What is claimed is:

1. A dispensing cartridge assembly, comprising:

at least one treating chemistry container configured to store multiple doses of treating chemistry;

a chemistry detector outputting a first signal indicative of an amount of treating chemistry in the at least one treating chemistry container;

an illumination detector outputting a second signal indicative of ambient illumination;

an indicator outputting a human-detectable signal; and

a controller receiving the first and second signals and operably coupled to the indicator to activate the indicator to emit the human-detectable signal in response to the first signal indicating a predetermined amount of treating chemistry and the second signal indicating a predetermined amount of illumination.

2. The dispensing cartridge assembly of claim **1** wherein the predetermined amount of treating chemistry is less than or equal to a low level of treating chemistry.

3. The dispensing cartridge assembly of claim **2** wherein the low level of treating chemistry comprises a predetermined number of doses of treating chemistry remaining in the at least one treating chemistry container.

4. The dispensing cartridge assembly of claim **2** wherein the low level of treating chemistry comprises an empty treating chemistry container.

5. The dispensing cartridge assembly of claim **1** wherein the predetermined amount of illumination is greater than 30 lux.

6. The dispensing cartridge assembly of claim **1**, further comprising multiple treating chemistry containers with corresponding chemistry detectors.

7. The dispensing cartridge assembly of claim **1** wherein the chemistry detector comprises a level sensor.

8. The dispensing cartridge assembly of claim **7** wherein the level sensor is an array of spaced electrodes.

9. The dispensing cartridge assembly of claim **1** wherein the illumination detector comprises a photo-detector.

10. The dispensing cartridge assembly of claim **1** wherein the human-detectable signal comprises at least one of a visible signal and an audible signal.

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